

**Technology Development Initiatives and Partnership Program
Request for Funding
FY2004**

FHWA Strategic Goal Area:
Productivity.

FLH Technology Strategy:
Improve Information Sharing, Incorporate new technology into daily work

Project Title:
GPS Digital Camera Data Integration.

Problem Statement:

Although a powerful and useful tool, a few shortcomings exist with the current configuration of GPS Photo Link. First, to make the software effective, one has to carry a digital camera and a separate GPS unit. This is undesirable for several reasons: An individual has to keep track of and operate two separate pieces of equipment at once. If both units are not set up correctly, the GPS coordinates and digital photos cannot be matched back in the office. Additionally, one has to keep track of the GPS time when the photo session starts. If this is not done, the GPS coordinates and digital photos cannot be matched back in the office. A solution is needed that would provide digital photo capabilities and GPS capabilities integrated into one unit.

A second shortcoming involves problems with older GPS units. Some of these older units will not communicate with the GPS Photo Link software. In this case, one either has to enter the data by hand or purchase a new standalone GPS unit. Entering the data by hand is time consuming and subject to error. Because of these factors most people end up purchasing a new standalone GPS unit. It would probably be less expensive to purchase one package that seamlessly integrated the digital camera, GPS unit, and software instead of purchasing each of these separately.

A third shortcoming is the inability to download topographical maps based on GPS coordinates. Topographical maps provide vital information to the FHWA and its partner agencies, and it would be beneficial to have the software automatically download these maps.

A fourth shortcoming involves the usefulness of the software for providing and sharing information with other FHWA employees and with FHWA's partner agencies. Currently, an individual has to have web access in order to view all of the information that GPS Photo Link makes available. This works fine when one is in an office, but out in the field where web access is not available, one cannot view all of the available information. This hinders effective communication regarding a project. Having the software download and save all of the information into one place that could be viewed in the field would solve this problem.

Background:

Currently, the FHWA uses a product called GPS Photo Link to combine digital photos, aerial photos, and GPS coordinates. The user carries a standalone GPS unit into the field while taking digital photos. Back at the office, the photos are downloaded from the camera and the GPS coordinates are downloaded from the GPS unit. Using information manually recorded in the field, the user runs GPS Photo Link, which matches the photos and the GPS coordinates. The software also links to aerial photos from the Internet based on the GPS coordinates of where the picture was taken. The software produces an html file that contains the digital photos, the GPS coordinates, and the links to the aerial photographs.

This software has proven useful at the FHWA because it allows someone who has never visited a project to get an idea of what the project looks like from the ground and the air, and this person can then communicate details of the project more effectively. Additionally, it allows that person to travel to the location the photos were taken later based on the GPS coordinates.

As useful as this software is, this technology is still in its infancy, and a lot of features could be added to both the hardware and software end that would make this whole thing a lot more useful to the FHWA and its partner agencies. The company that created GPS Photo Link software currently has partnered with a digital camera company to produce a camera that has integrated GPS capabilities. The GPS capabilities are integrated with the camera through Compact Flash (CF) memory, and packages will be sold that include the camera, a GPS CF card, and a version of GPS Photo Link updated to work with this camera. Additionally, the software manufacturer is open to developing the software further to provide enhanced capabilities. These capabilities include the ability to link to topographical maps in addition to aerial photos, and the ability to download this to one file that would be portable and available to anyone, even without web access. Additional improvements include adding a laser rangefinder to a camera so that distance information can be fed to the camera and the GPS Photo Link software. The software could then use the distance information and focal length information to superimpose a scaled grid over a digital photo.

Benefits:

The benefits to a combined digital camera, GPS unit, and software package are many. First, overall communication within the FHWA and between the FHWA and its partner agencies would be improved. The FHWA would be able to send anyone with access to a computer an html file that would allow the simultaneous viewing of a digital photo, the GPS coordinates of where the picture was taken (with a superimposed, scaled grid as an option), an aerial view based on GPS coordinates, and a topographical map based on GPS coordinates. With improvements to the software, one would not need to have access to the web to view this information once created. The only time one would need access to the web is when the html file is first created. This would allow the FHWA to disseminate useful information to a wider audience and would make the information available in the field instead of just in the office.

Additional benefits include; only have to carry, operate, and keep track of one unit; eliminating the need to enter certain time information into the software manually; a package including the camera with integrated GPS and the software would be less expensive than

buying a digital camera, a GPS unit, and the software separately; as GPS capabilities advance, the cameras integrated GPS functions could be updated with the purchase of a new CF card, which would be cheaper than buying a new GPS unit.

Scope:

Phase One

The deliverable from Phase One of this project will be to obtain the package that includes a camera with GPS and GPS Photo Link software that works with the camera. Included in the software will be an updated software package that allows a standalone html file to be created that can be viewed by anyone with a computer regardless of whether the user has access to the Internet. This updated software package also will automatically download topographical maps from the web at the time the original html file is created.

Phase Two

Phase Two of this project involves developing a camera configuration that combines GPS capabilities and a laser range finder into one compact package. The GPS Photo Link software will be updated to use the GPS and distance information to create a scaled grid that the user can opt to have superimposed over the digital image.

At the end of the project, the project champions will prepare a report that documents the success of the product. The report will describe the product, its effectiveness at meeting the objectives of this project, and the products usefulness to the FHWA and its partner agencies.

Deployment Method:

The expected product from this proposal is an all-in-one package that includes a camera with integrated GPS and software that allows an individual to combine digital photos, GPS coordinates, a scaled grid, aerial maps based on GPS coordinates, and topographical maps based on GPS coordinates into one file that can be viewed by anyone with access to a computer, independent of access to the internet.

The audience for this product includes the FHWA, its partner agencies, consultant, and the public. Within the FHWA, employees from planning to construction could make use of this product. For example, the Planning and Programming section could create a photo package that the Tri-Agency could use to help program the project. Later, Design and Environment could use the package for project discussions with partner agencies and to help disseminate information to the public. The package could be sent to resource agencies to help when obtaining permits. Project engineers could create a package and e-mail it back to the office to facilitate discussions regarding construction issues on active projects.

Obstacles to the successful completion of this project are few. A camera with integrated GPS capabilities is being developed already, and the software manufacturer for GPS Photo Link is updating its software to work with this camera. Likewise, digital cameras already exist that have built in laser rangefinders. In addition, the software manufacturer is willing to modify GPS Photo Link to provide the capabilities the FHWA is seeking. The biggest obstacle will be finding someone to produce a camera that has both GPS capabilities and a laser

range finder integrated into the same camera; however, the technology exists to do such a thing.

Estimated Costs:

The total estimated cost of this proposal including deployment is \$3,250

GPS compatible Camera	\$1,250
Camera Peripherals	\$ 500
Compact Flash GPS unit & software	\$ 500
Laser Range Finder Software / Hardware maintenance / upgrade	\$1,000

Duration:

Hardware and Software acquisition	Summer 2004
Field testing and data acquisition	Summer/Fall/Winter 2004
Quarterly progress reports to TD	2004 / 2005
Final Report	March 2005

Champions:

Greg Humphreys
WFLHD, Environmental Protection Specialist

Bradley Roberts
WFLHD, Technology Deployment Systems Coordinator